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Kloster

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[54] SPRING COMPRESSOR TOOL

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Related U.S. Application Data

[63] Continuation of Ser. No. 547,918, Feb. 7, 1975, abandoned.

[51] **Int. Cl.**[2] **B23P 19/04**

[52] **U.S. Cl.** **254/10.5**; 29/227

[58] **Field of Search** ..... 254/10.5, 93 R; 29/215-218, 225-227, 252

[56] **References Cited**

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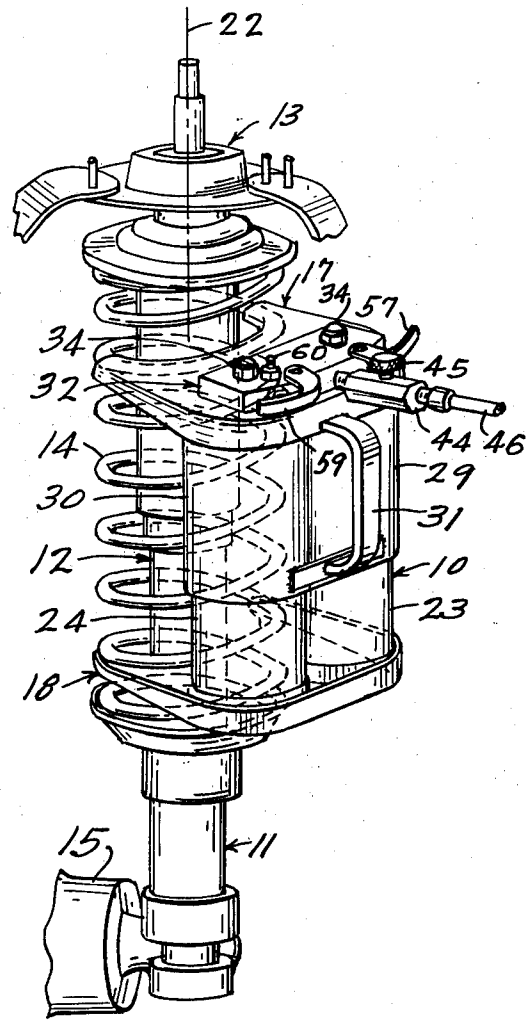
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[57] **ABSTRACT**

A spring compressor tool is disclosed for use on, for example, the independent suspension assembly of a vehicle, without the necessity of removing the suspension from the vehicle. The tool includes upper and lower U-shaped pressure shoes having helical-shaped outer peripheries for receiving spaced coils of the spring intermediate the opposed connected ends of the spring. A pair of pneumatic cylinders are positioned between the upper and lower shoes. Cylinder rods extend within the cylinders and mount pistons at one end. A header assembly includes pressurizing and venting valves and the cylinder rods define air passageways which communicate with the header assembly and with the cylinders. Return springs are provided adjacent the rods to urge the shoes to a non-compressed position. Air pressure is provided through the passageways to move the shoes toward one another to compress the suspension assembly spring.

10 Claims, 3 Drawing Figures



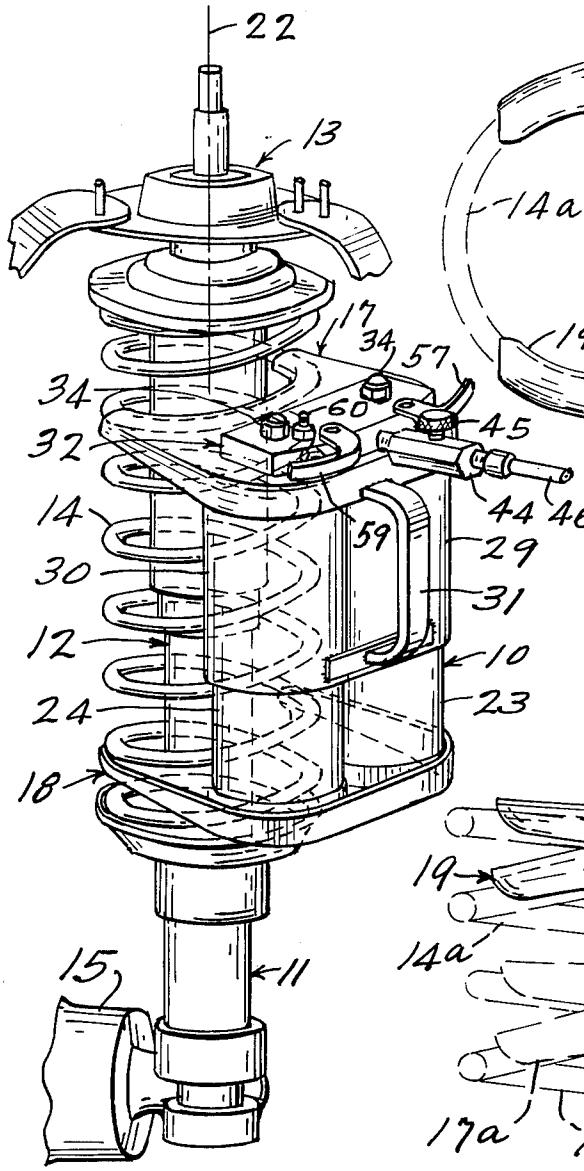


FIG-1-

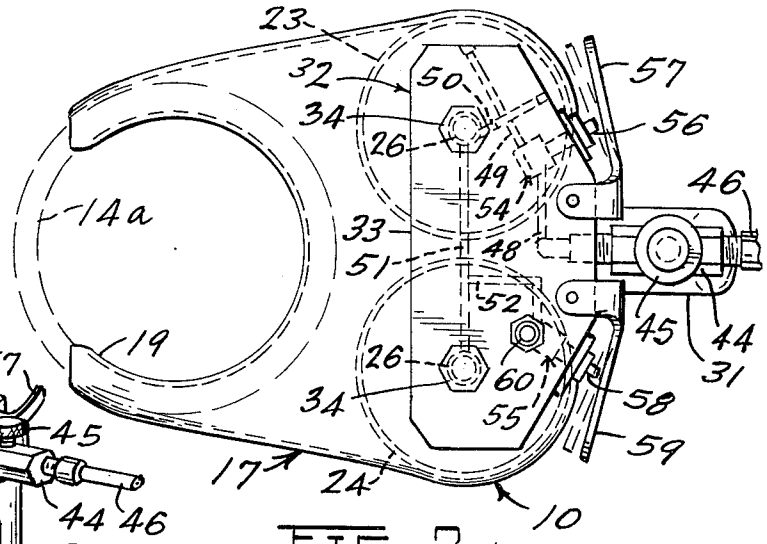


FIG-2-

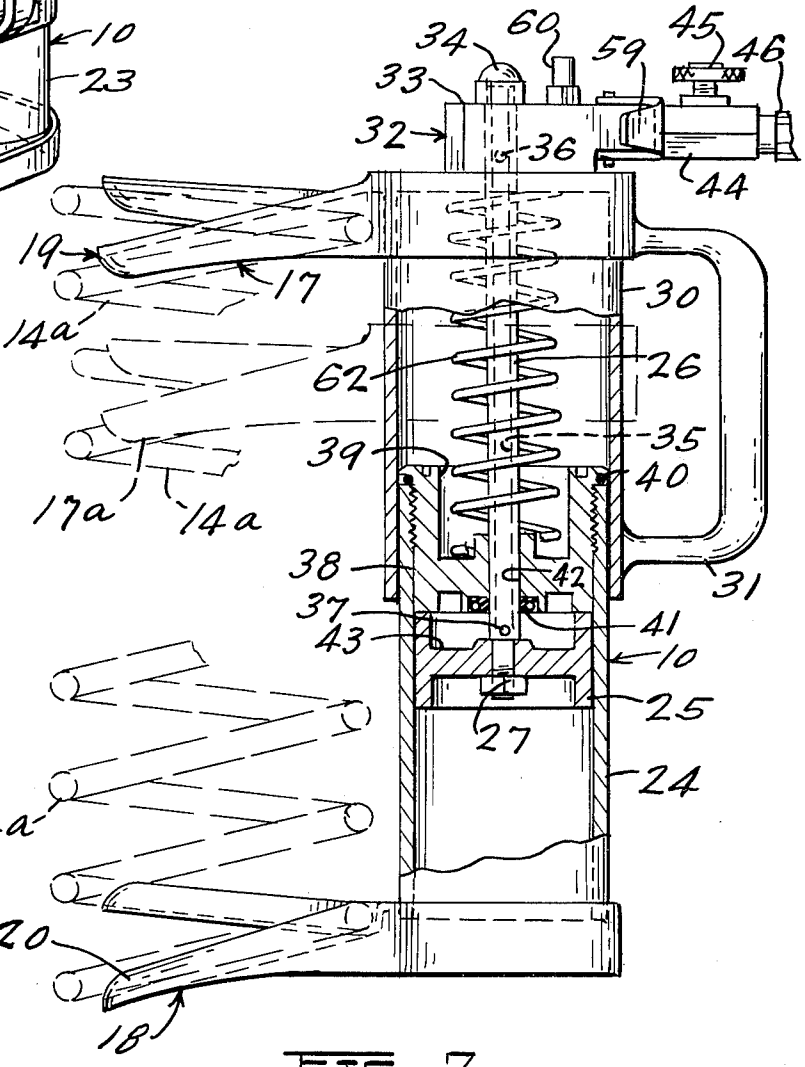


FIG-3-

SPRING COMPRESSOR TOOL

This is a continuation, of application Ser. No. 547,918 filed Feb. 7, 1975, now abandoned.

BACKGROUND OF THE INVENTION

The need for a tool to compress heavy coil springs is well known in the art. The need for such tools has become even more important since more and more vehicles having independent suspensions are now in use. Many of these vehicles use a McPherson type strut suspension which is particularly popular on imported vehicle because of its space saving attributes. The heavy coil springs are compressed and support a substantial part of the vehicle weight. In the after market, the independent suspensions must be serviced, particularly the shock absorber cylinder which in the MacPherson type independent suspension is located within the heavy coil spring. Often a frame hoist is used, but even when the supporting members engaged by the spring are spaced apart at their maximum distance, the heavy coil spring is often still under a load and must be compressed still further before it can be removed. Mechanical linkages have been used in the prior art to compress the heavy springs, for example the type shown in U.S. PaT. No. 1,342,529. However, many of these prior art tools have been clumsy to use and relatively inefficient.

More recently, bench type tools, for example the spring compressor shown in U.S. Pat. No. 3,814,382, have been introduced to the marketplace. However, to remove the coil spring from a vehicle and then to insert it into a bench type tool is time consuming. Manual spring compressors are often used in the initial operation. Because the heavy duty springs are helical in configuration and under load, it is not unusual for the manual tool to slip from the engaged coils of the spring.

SUMMARY OF THE INVENTION

The present invention is directed to a spring compressor tool which is used in situ. Because the tool compresses the spring in place allowing, for example, the MacPherson type cartridge to then be removed and serviced, the overall garage or servicing operation is reduced substantially over that known in most prior art tools.

The present spring compressor tool includes upper and lower pressure shoes which in a preferred embodiment define generally U-shaped helical outer peripheries for receiving a coil of a loaded spring at positions intermediate the opposed and connected ends of the spring. The design of the shoes places the load or force in a direction parallel with the longitudinal axis of the spring even though the load applying shoes are acting on the helical surfaces of spaced coils of the spring. Cylinder means are connected between the upper and lower pressure shoes and the cylinder rod has a longitudinal passageway which is in communication with a header assembly. The header assembly directs air downwardly through the rod passageway into the cylinder. This drives the upper and lower shoes toward one another and compresses the heavy coil spring. The header assembly includes a vent valve which exhausts the cylinder to atmosphere and a return spring assembly repositions the upper and lower shoes to their non-compressed position.

In a preferred embodiment of the present invention, a pair of cylinders are utilized. The action of the pair of cylinders aids in preventing torquing of the upper and lower shoes and helps to insure that the force is applied parallel to the longitudinal axis of the spring.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view, partially diagrammatic, showing a spring compressor tool, according to the present invention, being used to compress the spring of a MacPherson type suspension;

FIG. **2** is a top plan view of the spring compressor tool shown in FIG. **1** and indicating the air passageway system in dashed lines; and

FIG. **3** is an enlarged elevational view, partially in cross section, showing the spring compressor tool of FIG. **1.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A spring compressor tool, according to the present invention, is generally indicated in the drawings by the reference number **10.** A MacPherson type strut assembly is generally indicated in FIG. **1** by the reference number **11.** The strut assembly **11** may include, for example, a cylinder **12,** an upper mounting assembly **13** and a heavy coil spring **14.** The strut assembly **11** is normally connected to, for example, a lower control arm **15.**

The spring compressor tool **10** includes an upper pressure shoe **17** and a lower pressure shoe **18.** The shoes may be of differing spring receiving configurations, however in a preferred embodiment, both the shoes **17** and **18** are generally U-shaped and define helical outer peripheries **19** and **20,** respectively, which are suitable to receive spaced coils of the coil spring **14.** Referring to FIGS. **2** and **3,** it is noted that in plan view, the helical outer periphery **19** defines a circular configuration which has the same planar radius as the coil spring **14** while in the elevational view, it is noted that the helical configuration of the periphery **19** provides a close engagement with the coil of the spring **14** which is indicated in dashed lines by the reference number **14***a.* The same is true with respect to the helical outer periphery **20.** The configuration of the upper and lower pressure shoes **17** and **18** insures that the force applied by the pressure shoes **17** and **18** is in a direction parallel to the longitudinal centerline of the coil spring **14,** indicated by the reference number **22** in FIG. **1.**

One or more cylinders are positioned between the shoes **17** and **18.** The positioning of the cylinder between the two shoes **17** and **18** has been found to be advantageous. In the present embodiment a pair of cylinders **23** and **24** are mounted on the lower pressure shoe **18.** A piston **25** is provided in each of the cylinders **23** and **24** and a piston rod **26** is connected by a nut **27** to the piston **25.** Cup-shaped sleeves **29** and **30** are telescoped over the cylinders **23** and **24,** respectively, and mount the upper pressure shoes **17** at their upper ends. In the present embodiment, a handle **31** is mounted on the sleeves **29** and **30** and on the upper pressure shoe **17** and serves as a carrying handle for the spring compressor tool **10.** In one embodiment (not shown), the air valving controls are positioned within and on the handle **31.**

A header assembly, generally indicated by the reference number **32,** includes a header block **33** which is mounted on the upper pressure shoe **17.** The upper ends of the piston rods **25** extend through the pressure shoe **17** and the header block **33** and are secured by nuts **34.** A longitudinally extending air passageway **35** extends

through each of the piston rods **26** and includes an upper opening **36** adjacent the header block **33** and a lower opening **37** adjacent the piston **25.**

Referring to FIG. **3,** a cylinder cap **38** having a cup-shaped recess **39** is threadably fixed to the upper end of each of the cylinders **23** and **24.** Preferably, pneumatic seals **40** are provided between the cylinders **23** and **24** and their respective caps **38.** Similarly, pneumatic seals **41** are preferably provided between the caps **38** and the cylinder rods **26** adjacent a central bore **42** which is defined by the caps **38** and which receive the piston rods **26.**

A cylinder chamber **43** is defined in each cylinder **23** and **24** between its respective piston **25** and cylinder cap **38.**

The header assembly **32** includes an inlet fitting **44** and an air regulator valve **45.** The fitting **44** is in communication with a source of air pressure, for example, an air hose **46.** The inlet fitting **44** is threadably engaged in the header block **33.** The header block **33** defines a series of air passageways, indicated by the reference numbers **48, 49, 50, 51** and **52** in FIG. **2.** The header block **33** also receives a pair of valve assemblies, generally referred to by the reference numbers **54** and **55.** The valve assemblies **54** and **55** are pneumatic valves, known in the art. The valve assembly **54** includes a valve actuator **56** and a valve arm **57** which is pivotally mounted on the header block assembly **33** in engaging relationship with the valve actuator **56.** Similarly, the valve assembly **55** includes a valve actuator **58** and a valve arm **59.** The valve assemblies **54** and **55** are normally closed and are opened upon the depression of their respective valve arms **57** and **59.** A vent fitting **60** is mounted on the header block **33** and is in communication with the air passageway **52.**

To use the spring compressor tool **10,** the upper and lower pressure shoes **17** and **18** are moved into position so that their respective helical outer peripheries **19** and **20** engage spaced ones of the coils of a loaded coil spring. In other words, it is not necessary to use manual spring compressors initially as is true with, for example, the spring compressor tool shown in U.S. Pat. No. 3,814,382, mentioned above.

It is important that the helical outer peripheries **19** and **20** snugly engage the individual coils so that the first application is parallel to the longitudinal centerline **22** of the coil spring **14,** as discussed above. The valve **45** is opened and fluid under pressure passes into the passageway **48.** The valve assembly **54** is moved to an open condition by depressing the valve arm **57** which engages the valve actuator **56.** This allows the fluid under pressure to enter the passageway **50,** the passageway **51** and both of the longitudinally extending air passages **35** located in the piston rods **26.** The passages **50** and **51** are in direct communication with the upper openings **36** defined in the piston rods **26.** Fluid under pressure then enters the respective cylinder chambers **33.** A return spring **62** surrounds each of the piston rods **26** and is positioned between the top of the cup-shaped sleeves **29** and **30** and the respective cup-shaped recesses defined in the cylinder caps **38.**

The fluid pressure entering the cylinder chambers **43** urges the pistons **25** downwardly in their respective cylinders **23** and **24** against the force of the return springs **62.** This moves the upper shoe **17** from its non-compressed position indicated in solid lines in FIG. **3,** to its compressed position indicated by the dashed lines in FIG. **3.** This, of course, compresses the heavy coil spring **14.** The mechanic may now quickly and safely remove the upper mounting assembly **13** of the strut assembly **11** and the other related components to, for example, service or replace the MacPherson type cylinder **12.**

The mechanic determines the travel of the shoes **17** and **18** by the length of time in which he depresses the valve arm **57.** It has been found that the time required to disassemble the strut assembly **11** has been reduced from approximately 30 minutes to approximately 5 minutes by using the tool **10.**

To return the spring compressor tool **10** to its uncompressed position, indicated by solid lines in FIG. **3,** the mechanic depresses the valve arm **59.** This in turn operates the valve actuator **58** and places the valve assembly **55** in an open condition. The valve assembly **55** is in communication with the vent opening **60** and the entire system is vented to atmosphere through the passageway **52,** the valve assembly **55** and the vent fitting **60.** Upon venting to atmosphere, the return springs **62** urge the cup-shaped sleeves **29** and **30** upwardly and the shoes **17** and **18** are returned to their uncompressed condition.

While the valving and pneumatic arrangement shown in the drawings has proved to be satisfactory, other types of air valving and air systems may be utilized. For example, the valving may be placed in the handle **31,** as mentioned above. Also, while a pneumatic cylinder system has been shown, the system may also be hydraulic.

It has been found that the dual cylinder arrangement, namely the cylinders **23** and **24,** provide a device which greatly reduces torquing of the shoes **17** and **18** to apply a correct application of force to the spring **14.** This insures a safer tool for a mechanic to use as compared to many prior art tools. The tool **10,** according to the present invention, greatly reduces the time involved in servicing MacPherson type independent suspension systems. Also, it encourages the mechanic to service the individual components of the system rather than replacing the entire MacPherson strut assembly thereby saving the consumer both labor costs and material costs.

The specific tool and components herein illustrated and described are intended to be representative only, as certain changes may be made therein without departing from the teachings of the disclosure. Accordingly, reference should be made to the following claims in determining the scope of the present invention.

What I claim is:

1. A spring compressor tool for compressing a spring having opposed ends comprising, an upper pressure shoe having a generally U-shaped helical portion including walls defining a spring receiving channel, a lower pressure shoe having a generally U-shaped helical portion including walls defining a spring receiving channel, a pair of fluid cylinders positioned between said upper and lower shoes, a pair of telescoping sleeves surrounding an end of each of said fluid cylinders and connected to one of such shoes, each of said cylinders including a cylinder body, a piston positioned to slide within said body, a piston rod attached to said piston and extending through one of said telescoping sleeves, and a cap connected to one end of the cylinder body, said cap defining therethrough a bore for slidably receiving said piston rod, said cap and said piston defining a chamber, a fluid header assembly positioned adjacent said telescoping sleeve, said fluid header assembly defining an inlet air passageway connected to said chambers and a vent passageway connected to said cham-

bers, valving means for supplying air to said inlet air passageway and for venting said vent passageway to atmosphere, and spring return means positioned within said sleeves for urging said shoes apart.

2. A spring compressor tool, according to claim 1, wherein said fluid cylinders are pneumatic cylinders.

3. A spring compressor tool according to claim 1, wherein each of said piston rods defines a longitudinally extending air passageway and wherein said piston rod passageways connect said inlet air passageway and said chambers, whereby actuation of said valving means supplies air under pressure to said chamber thereby moving the upper and lower shoes together.

4. A spring compressor tool according to claim 3, wherein said spring return means comprises a spring surrounding at least one of said piston rods and positioned within said telescoping sleeve.

5. A spring compressor tool according to claim 4, wherein each fluid cylinder includes sealing means between said cap and said piston rod for retarding the passage of air from such chamber.

6. A spring compressor tool according to claim 4, wherein said valving means comprises a normally closed valve in communication with such inlet air passageway, said valve having a valve actuator and a valve arm adjacent said actuator for engaging such actuator and opening said valve, whereby, when said valve is actuated, air under pressure is supplied through the said valve, such air passageway and such piston rod passageways to such chambers.

7. A spring compressor tool, according to claim 6, wherein a vent fitting is mounted on said fluid header assembly in communication with such vent passageway and wherein said valving means includes a second normally closed valve in communication with such vent passageway, said second valve having a valve actuator and a valve arm adjacent said actuator for engaging said actuator and opening said second valve, whereby, when said second valve is actuated, air under pressure in such chambers is vented through said piston rod passageways, such vent passageway and said vent fitting to atmosphere.

8. A spring compressor tool, according to claim 7, including a handle connected adjacent said sleeves.

9. A portable spring compressor tool for compressing in situs a loaded spring having opposed ends, comprising, a first pressure shoe having a generally U-shaped helical portion, said helical portion having inner and outer walls defining a continuous first channel which extends at least 180°, said first channel receiving a coil of such loaded spring at a position intermediate such opposed ends, a second pressure shoe spaced from said first pressure shoe, said second pressure shoe having a helical portion having inner and outer walls defining a continuous second channel receiving another coil of such loaded spring at a position intermediate such opposed ends, at least one fluid cylinder including a cylinder body, a piston positioned to slide within said cylinder body and a piston rod attached to said piston, means limiting said piston rod to linear movement as said attached piston is moved in said cylinder body, said cylinder body and said piston defining a fluid chamber, means attaching said first shoe to said piston rod, means attaching said second shoe to said cylinder body, means for supplying pressurized fluid to said fluid chamber to move said piston in said cylinder body, said first shoe moving toward said second shoe along a linear path to compress such spring as such pressurized fluid moves said piston, means for venting fluid from said fluid chamber, and return means for urging said first and second shoes apart whereby said spring is compressed without removing such spring from place.

10. A portable spring compressor tool, according to claim 9, wherein a pair of said fluid cylinders are connected in parallel between said first and second shoes, wherein a pair of telescoping sleeves surrounds said cylinders and are connected to said first pressure shoe, and wherein said fluid supplying means and said fluid venting means includes a fluid header assembly positioned adjacent said sleeve, said fluid header assembly defining an inlet air passageway and a vent passageway connected to said fluid chamber in each fluid cylinder, and valving means for supplying air to said inlet air passageway and for venting said vent passageway to atmosphere.

* * * * *